— EARTH EXPANSION —

THE DEFINITIVE PROOF

Studies of oceanic geology and the distribution of ancient fauna and flora indicate that our planet has been expanding throughout its vast history.

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MODERN DATA QUANTIFIES EARTH EXPANSION

From my introduction to Global Expansion Tectonics in NEXUS 7/06, it should be realised that the 200 million years of Triassic-to-present Earth expansion modelling studies presented represent only 4% of the known Earth history. This 4% of Earth history is highlighted by the development and opening of all the present ocean basins, expanding from a Pangaean Earth at approximately 50% of the present radius. What should be realised from my article is that Earth expansion has also been active throughout the remaining 4,300 million years, or 96% of Earth history.

This realisation is poorly understood and generally overlooked by most. The 96% of Archaean to Triassic Earth expansion history is made up of highly contentious continental crustal extension, and to my knowledge has never before been investigated or considered from an expanding Earth perspective. It is contentious because few people realise the flexibility of our continents over the 4,300-million-year time span involved, and most still consider that continents have retained a constant surface area throughout time, with new crust added at the margins by accretion of oceanic debris.

While the key to understanding Earth expansion is illustrated by development of the oceans from the Triassic period to the present, to quantify Earth expansion we must use the geological and geophysical data preserved in 100% of Archaean to present Earth history. This modern data is routinely collected; however, it is singularly applied to plate tectonics without consideration of alternative concepts such as Earth expansion. All of this new data provides a means to quantify Earth expansion and, depending on your willingness to accept change, provides definitive proof of Earth expansion.

EXPANDING EARTH MODELS

A set of 24 spherical models has now been constructed, 23 covering the Archaean aeon to recent and one projected to five million years into the future (figure 1). The primary base map used during construction of each model is the *Geological Map of the World* (CGMW & UNESCO, 1990; figure 1 in NEXUS 7/06 article), which provides a comprehensive global coverage of continental and oceanic geology.

As noted in NEXUS 7/06, the completion of oceanic magnetic mapping and age dating of crust beneath all the Earth's major oceans has provided an important geophysical contribution to the quantification of Earth expansion. This oceanic mapping has placed finite time constraints on the plate motion history shown in all the ocean basins back to the Early Jurassic period, and is used to quantify both plate reconstruction and rate of crustal generation on expanding Earth models.

To construct the models, moving backwards in time from the present, successively older geological periods which parallel the mid-ocean spreading ridges are removed. Each crustal plate is then restored to a pre-spreading, or pre-extension, configuration at a reduced Earth radius along their common plate or continental margins respectively. By successively removing oceanic crust and reuniting the continental and oceanic plates, each post-Triassic model demonstrates a better than 99% plate fit-together.

During the Triassic period, continental crust plus sediments deposited in basins along the continental margins envelop the Earth with a complete continental shell at about 52% of the present Earth radius. These sedimentary basins then form a global network, representing shallow seas surrounding and lapping onto ancient continental lands.

This unique fit-together of lands and seas during the Mesozoic and Cenozoic eras demonstrates that Earth expansion is a viable process and gives justification to extending modelling studies back to the Archaean aeon.

Extending models to the Archaean involves recognising that continents are made up of ancient granite–greenstone crustal fragments called *cratons*, ancient eroded mountains or fold belts called *orogens*, and ancient sedimentary basins of various ages. Earth expansion occurs within the continents as crustal extension in the network of continental sedimentary basins and rift zones. Moving backwards in time, sediments deposited within extensional basins and rift zones are progressively removed and crust is restored to a pre-extension configuration. By removing all basin and rift sediments, a primordial Earth is reconstructed for the Mesoproterozoic era (1,600 million years ago), comprising assembled Archaean cratons and Proterozoic basement rocks at about 1,700 kilometres radius.

Expanding Earth models reveal that the distribution of continental sedimentary basins and shallow seas, continental magmatism and concentration of crustal movements form a global network surrounding assembled Precambrian crust. The Precambrian global network forms the loci for ongoing continental crustal extension, basin sedimentation and crustal mobility during the Proterozoic and Palaeozoic eras and represents the primary loci for continental break-up and opening of the modern oceans during the Mesozoic and Cenozoic eras.

This process of progressive continental crustal extension during Earth expansion demonstrates a simplified development of continents and oceans throughout Earth history, as continental crust progressively extends prior to continental rupture, break-up and dispersal of continents to the present.

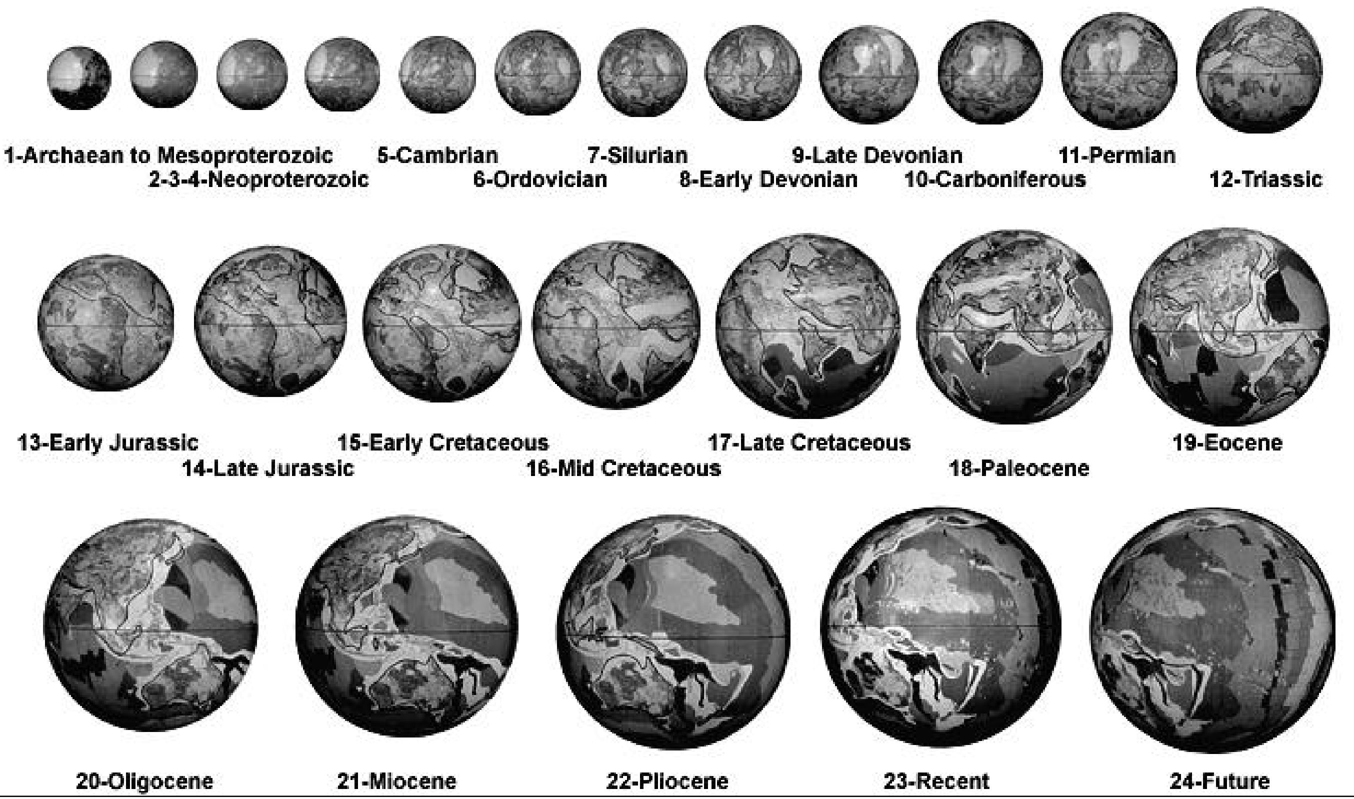
THE EARTH IS A GEOLOGICAL ENTITY

All rocks contain an immense amount of geological and geophysical information which, to the trained eye, has a complex but variable history of formation, metamorphic change, chemical and erosive weathering, climatic influence, biotic activity and metallic worth to tell us. On a global scale, we can piece together geological and geophysical information about locations of ancient poles and equators (palaeomagnetics), ancient distributions of exposed land, mountains, ice-caps, seas and shorelines (palaeogeography), ancient distribution, dispersal patterns, climatic requirements and extinctions of flora and fauna (palaeobiogeography), distribution of ancient climatic zones distinguished by latitude-dependent rocks located from polar ice-caps to equatorial zones (palaeoclimatology), and formation and distribution of metallic and hydrocarbon resources (metallogeny).

On an expanding Earth, the information available from each of these geological and geophysical disciplines can be visualised as they happen and where they happen, and we can see what has subsequently happened. Biotic species and climatic zones established before continental break-up, for instance, are fragmented and dispersed in sympathy with dispersal of continents. New biotic species will either displace or interact with existing species, and climatic change will superimpose on established climatic patterns.

A good example is Antarctica, which straddled the equator throughout most of Earth history and has preserved an essentially tropical-to-temperate range of fossilised plant and animal species and rock types. Since the Permian period (260 million years ago), Antarctica migrated south to its present location straddling the present south pole, with extreme changes to climatic patterns and

Figure 1: Expanding Earth models from the Archaean to Future, showing ancient coastlines (heavy lines), emergent land surfaces and shallow continental seas. Each image advances 15 degrees longitude throughout the sequence to show a broad coverage of geographical development during the Precambrian and Phanerozoic aeons.



biotic species.

This geological and geophysical information is traditionally used in plate tectonic reconstructions of continents to limit plate-fit options imposed by palaeomagnetics on a constant-radius Earth. In many instances, the information is contradictory; in particular, climate-critical floral and faunal information from biogeography and distribution of climate-dependent rocks such as limestone, coal and glacial debris. On an expanding Earth, there is only one plate-fit option. If the geological and geophysical information is not supported or substantiated by the reconstruction, then the reconstruction is wrong; there are no alternative fit-options available.

Published palaeomagnetic information can be plotted on expanding Earth models to locate the magnetic poles and derive an equator. The information demonstrates the pole data plot as diametrically opposed north and south poles for every era and period from the Archaean to Recent. Locations of the equators agree in principle with conventional locations based on climate indicators. The clustering of north and south poles is impossible, however, on conventional plate tectonic models and demonstrates that palaeomagnetic data can be more effectively used to quantify the location of ancient poles on an expanding Earth.

Instead of mountains forming by continental collision, on an expanding Earth they form by vertical uplift, creating plateaus.

PALAEOGEOGRAPHY

The ancient geography of our Earth forms the basis for defining the interrelationships of exposed continental areas, intervening seaways, mountains and crustal movements, and enables the conventional ancient continents of Pangaea, Gondwana, Laurentia, Baltica, Laurussia and Rodinia to be quantified on an expanding Earth.

On plate tectonic reconstructions of continents, large ancient oceans—Panthallassa, Tethys and Iapetus—are required during times when continents were assembled into supercontinents. However, outlines of ancient coastal geography plotted on expanding Earth models (figure 1) show that large Panthallassa, Tethys and Iapetus oceans are not required because all modern oceans are removed and continents are assembled as a single continental crust at a reduced Earth radius. Instead, these inferred oceans are replaced by smaller Panthallassa, Tethys and Iapetus seas, located on or between the ancient continents.

On an expanding Earth, the early Panthallassa and Iapetus seas developed during the Early Permian to Early Jurassic periods (260 to 160 million years ago) as shallow sedimentary basins within the present northwest Pacific Ocean and north Atlantic Ocean regions respectively. These then progressively opened and extended throughout the Mesozoic and Cenozoic eras as the modern Pacific and Atlantic oceans.

In contrast, the Tethys Sea had its origins during the Early Proterozoic era as a continental sea located within Europe and Asia, progressively enlarging and extending in area during the Proterozoic, Palaeozoic and Mesozoic eras. It is now represented by continental Europe and Asia and the Mediterranean Sea.

Changes in sea-level on an expanding Earth occur in response to climatic change, to a shift in the distribution of continental seas, to crustal movements, mountain building, erosion, opening of post-Permian modern oceans, and the production of new water at the mid-ocean ridges.

These changes all modify the ancient coastal outlines and result in a change in exposed continental land, in the distribution of climate-dependent sedimentary rocks such as limestone, and in the distribution of certain marine and terrestrial species which depend on specific climate zones to survive.

Reconstructions of the conventional Rodinia, Gondwana and Pangaea supercontinents and smaller sub-continents on an expanding Earth demonstrate that, instead of being a random dispersion-amalgamation or collisional event, each continental assemblage is progressive and represents an evolutionary process over time. The distinguishing feature of continents constructed on each expanding Earth model is the interrelationship of continental sedimentary basins, the network of continental seas and the network of crustal movements. The variation of each of these in time results in a change in exposed continental land.

Supercontinent configuration is then defined by the progressive change in continental sedimentary basins, by crustal movements, and by the changing sea-level as modern oceans open and rapidly expand to the present.

Instead of mountains forming by continental collision, on an expanding Earth—they form by vertical uplift, creating plateaus. Changes in surface curvature during Earth expansion cause continental interiors to remain elevated or arched relative to the surrounding downwarped sedimentary basins. Periodic gravitational collapse of the interiors of each continent results in uplift and faulting along the continental margins, forming escarpments. This process is cyclical during ongoing expansion, resulting in multiple and overlapping phases of mountain building, erosion, planation, sedimentation, uplift and further erosion.

PALAEOBIOGEOGRAPHY

Palaeobiogeography is a study of the distribution of ancient flora and fauna. On an expanding Earth, ancient fauna and flora can be used to illustrate their distribution in relation to ancient geography and in relation to established poles and equators.

The distribution of various marine fauna—such as the Cambrian and Ordovician (560 to 440 million years ago) trilobites (segmented cockroach-like marine creatures)—on an expanding Earth demonstrates the ease and simplification of migration and development of these creatures during the Palaeozoic era, without the need for complex conventional continental assemblage-dispersal requirements. Barriers to migration of trilobites and other marine species on an expanding Earth are then limited to deep-marine restrictions and, to a limited extent, latitude and climate extremes.

Triassic to Cretaceous dinosaurs plotted on expanding Earth models demonstrate that dinosaur distributions are clustered within three distinct provinces, coinciding with the distribution of ancestral Permian reptiles. These include distributions clustered in Europe and the Mediterranean region, in central and eastern North America, and in the adjacent South African and southern South American regions, with links to India. Isolated distributions also occur in eastern Australia, southern China and western South America.

The distribution of dinosaurs and ancestral Permian reptiles on an expanding Earth demonstrates the close links between Permian, Triassic and Jurassic species. This link was then disrupted in the

Early Permian during continental break-up, and during the Cretaceous when seas began to rise and the established climate zones, feeding habitats and migration routes were disrupted.

The extinction of the dinosaurs is a contentious issue. The Cretaceous period coincided with a period of enlargement of continental seas, accompanied by a rise in sea-level, an increase in size of the modern oceans and progressive climatic disruption. Sea levels peaked on the continents during the Late Cretaceous, but this was followed by a rapid draining of continental seas to the present as the modern oceans continued to open.

Expanding Earth models suggest there may have been two or more separate oceans existing during the Mesozoic era, with the possibility of separate sea levels. Rifting and merging of these oceans coincides with faunal and floral extinction events at the end of both the Triassic and Cretaceous periods.

This suggests that the cause of the dinosaur extinction—which, incidentally, occurred over a period of 8 to 10 million years—may be linked with periods of rapid sea-level change rather than an inferred asteroidal impact event.

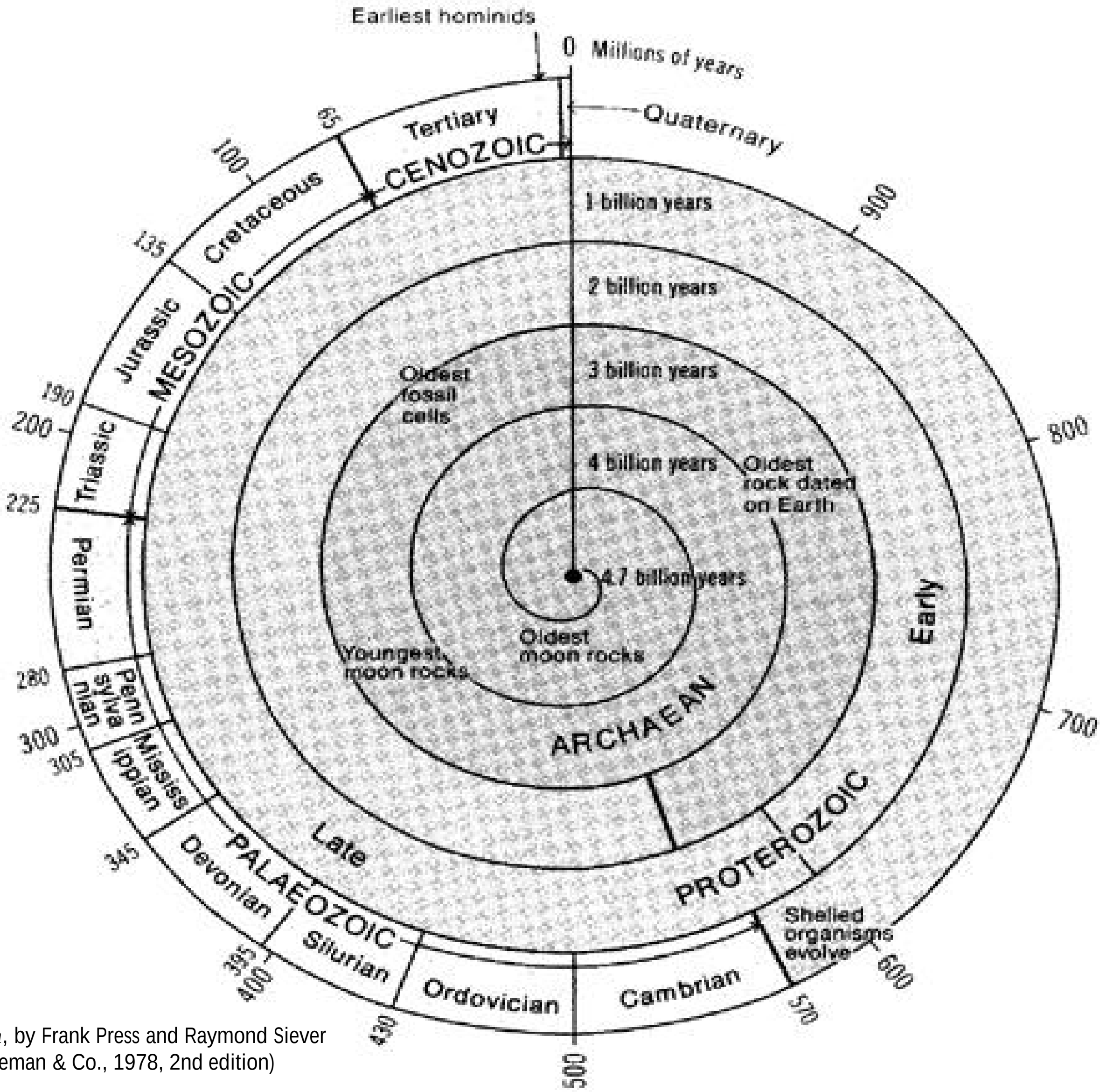
The ancient Permian fern *Glossopteris* is a common fossil in coals throughout the southern hemisphere and has traditionally been used to define the ancient Gondwana continent. The distribution of glossopteris ferns is centred on localities in South Africa and adjacent India.

During the Permian period, East Antarctica straddled the equator and was located adjacent to South Africa. East Antarctica was surrounded by occurrences of glossopteris in Australia, West Antarctica and India. This suggests that glossopteris flora may have been extensive beneath the present East Antarctic ice-cap.

The Permian glossopteris flora plotted on expanding Earth models straddle the palaeo-equator and range from high-northern to high-southern latitudes on the Gondwana supercontinent. This suggests that glossopteris flora were tropical to cool-temperate species, confirming the fossil evidence which shows a Gondwana climate commencing with an ice age and passing through a cold but wet temperate to warm temperate climate during the Late Palaeozoic.

The palaeobiogeographic examples used illustrate the ease and simplification of migration, development of faunal and floral species and influence of climatic and geographic change on an expanding Earth. These interrelationships between global and provincial distributions are maintained without the need for complex conventional continental assemblage-dispersal requirements.

During continental break-up and opening of the modern oceans,



From *Earth*, by Frank Press and Raymond Siever
(W. H. Freeman & Co., 1978, 2nd edition)

traditional distributions and migration routes were often disrupted, enabling species endemic to the various regions to interact, extend their boundaries, fragment or become extinct with time.

The timing of ocean development in many of these areas is reflected in changes in sea level, facilitating faunal migration by extending and expanding migration routes and moderating climatic differences.

PALAEOCLIMATOLOGY

The ancient climate on an expanding Earth is determined by plotting the distribution of climate-dependent rocks and comparing the distribution patterns with the location of ancient poles and equators. Coal swamps, thick sandstone sequences and glacial rocks are excellent indicators of wet climates, while dry climates are indicated by evaporites such as salt deposits and equatorial regions by coal and limestone rocks.

The glacial record shows four major glacial eras, including the Early Proterozoic, the Late Proterozoic, the Early and Late Palaeozoic and the Late Cenozoic (recent ice age). The distribution of glacial deposits on an expanding Earth is coincident in all cases with the location of magnetic poles established from palaeomagnetic data.

The distribution of many Precambrian marine glacial deposits occurs in conjunction with limestone and iron-rich rocks located at the equator. This is an enigma for plate tectonic reconstructions. On an expanding Earth, the relatively short pole-to-equator distances existing during this time allow sea-ice to float easily to equatorial regions within the network of shallow seas, depositing rock debris on the seafloor as the ice melts.

The distribution of Early and Late Palaeozoic glacial deposits coincides with a south pole located in western central Africa, with isolated mountainous ice-centres in Europe, Australia and South America. A northward shift in climate zonation and absence of a distinct north polar ice-cap is a prominent feature of glacial, limestone and coal distributions during this era. The northward shift in climatic zonation suggests that an inclined Earth rotational axis was well established by the beginning of the Palaeozoic era and has remained at a similar inclination to the present.

The distribution of oil and gas resources during the Palaeozoic, Mesozoic and Cenozoic eras coincides with the development of major sedimentary basins located within the continents and along continental margins. A broad zonation of deposits is evident on an expanding Earth, straddling the established palaeoequator and extending from low-southern to mid-northern latitudes. This broad zonation suggests a northward shift in climatic zonation and coincides with observations from glacial distributions.

When viewed in context with global and continental sea-level changes, oil and gas development coincides with periods where sea-level was rising and encroaching onto the continents. The early Cretaceous period in particular coincides with a period of post-Permian glacial melting, a rapid opening of the modern oceans, warming climatic conditions and a rapid diversification of fauna and flora.

Coal distribution during the Early to Late Cretaceous period shows two broad temperate belts located north and south of the established palaeoequator, with a predominance of deposits located in the northern hemisphere. On an expanding Earth, this shift in coal deposition is reflected in the rapid opening of each of the modern oceans and a northward migration of continents during the Mesozoic and Cenozoic eras. The predominance of coal deposits in the northern hemisphere is attributed to the greater extent of landmass influencing rainfall and to the extent of continental basins suitable for coal formation.

FACT OR MERE COINCIDENCE?

Expanding Earth models created with the use of oceanic geology data demonstrate that crustal plates fit together at a reduced Earth radius with a better than 99% fit. So, during the Triassic period each of the continents is reassembled like a spherical jig-saw puzzle, and continental sedimentary basins form a global network representing shallow continental seas. By progressively removing sediments from the sedimentary basins and restoring to a pre-extension configuration, each of the ancient continental crustal fragments can be assembled on a primordial Earth at an ancient radius of 1,700 kilometres.

When palaeomagnetic data is plotted on expanding Earth models, diametrically opposed north and south poles can be established. This is impossible to achieve with plate tectonics. The ancient equators established from the poles coincide with climatic indicators such as distribution of glacial rocks, limestone and coal and latitude-dependant faunal and floral species. Each climatic distribution shows a consistent northward shift in climate zones, suggesting an inclined rotational axis.

When palaeomagnetic data is plotted on expanding Earth models, diametrically opposed north and south poles can be established. This is impossible to achieve with plate tectonics.

Fauna and flora demonstrate a simplified distribution pattern consistent with climate zoning and distribution of continental seas. Disruption of species and extinction events coincide with break-up of continents, opening of modern oceans, change in climate and rapid change in sea level. Distribution and preservation of oil, gas and coal resources coincides with rapid floral development, changes in sea level and dispersal of continents. All of these cannot be mere coincidence. Each in itself is definitive proof that the Earth is expanding, and, collectively they quantify a simple process of progressive crustal extension prior to continental rupture, break-up and dispersal to the present. ∞

About the Author:
James Maxlow is a geologist with over 25 years' field exploration/mining experience. He has a Master's degree in geology and is currently completing a PhD in geology. He is principal researcher with Terrella Consultants, a Western Australian–based geological consultancy dedicated to research into and promotion of Global Expansion Tectonics. The consultancy values and encourages professional input from a worldwide network of Earth expansion researchers. For further information and/or input, e-mail the author at jmaxlow@enternet.com.au or visit his website, www.geocities.com/CapeCanaveral/Launchpad/6520/.